The importance of shaft centerline position

The use of proximity probe transducers has gained universal acceptance for measuring the shaft dynamic motion of rotating machinery. An equally important parameter for determining the mechanical integrity of a rotating system is average shaft centerline position. Since the proximity transducer is a dc voltage versus gap detection system, the average shaft centerline position measurement is provided along with the dynamic motion measurement.

When two orthogonal (XY) probes are installed at a radial bearing, the dc (gap) voltages provide a two-dimensional (cross-section) picture of both the dynamic vibration (orbit) and the average shaft centerline position.

Assuming that the shaft is located at the bottom center of the bearing clearance when a machine is at rest, all subsequent measurements can be referenced to this original position. During machine startup, the average shaft centerline position indicates the formation of the oil wedge, thermal effects and loading effects (Figure 1). During operation, it reflects the changing load conditions, including alignment.

Applications of this measurement include:

- Excessive bearing clearance or wear, for example, bearing babbitt erosion due to electrostatic discharge (Figure 2).
- Rotor Position Angle (Figure 3) as an indicator of abnormal or changing preloads (unidirectional, steady state loads).
- Eccentricity Ratio (Figure 4) which indicates how close the shaft is to the center of the bearing or to the babbitt. Decreasing eccentricity values can lead to an instability problem.

Average shaft centerline position information should always be trended as part of a comprehensive monitoring program. Significant changes should be investigated immediately. Correlation of position information versus normal operating conditions of load, temperature, process parameters, etc., will define the acceptable operating regions (Acceptance Regions). Position is one of the five pieces of vibration data needed to accurately describe the state of the machinery:

- Direct (unfiltered) amplitude
- Frequency
- Phase and amplitude at each frequency
- Position
- Shape or form (oscilloscope timebase and orbit display) ■

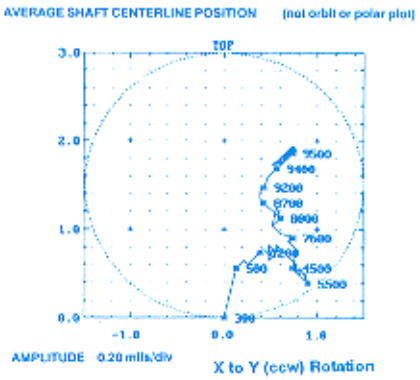

Figure 1

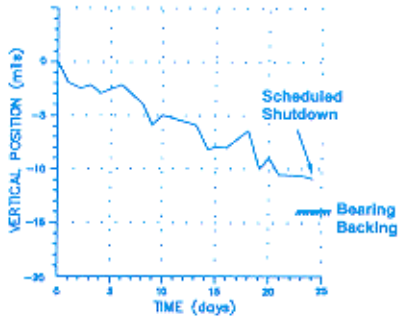

Figure 2

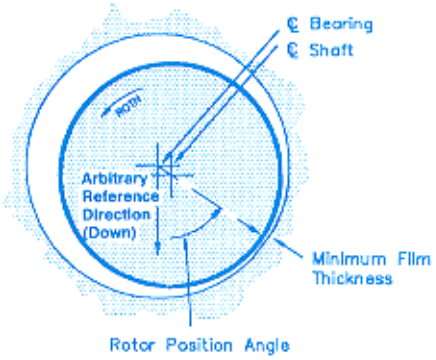

Figure 3

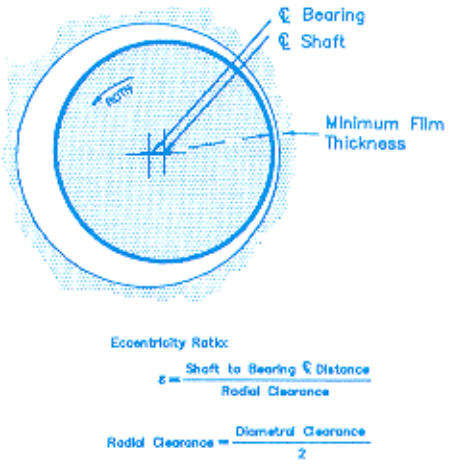

Figure 4